

July 2021

► Technical workshop on “Practices towards algorithmic management and their impact on workers”

Meeting report



International
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Technical workshop under *Research Activity N. 1* of the EU-funded ILO-JRC project “Building Partnerships on the Future of Work”.

15 and 16 June 2021

► Introduction

The workshop “practices towards algorithmic management and their impact on workers” was jointly organised by the JRC and the ILO, relying on existing JRC collaborations also with the EC DG EMPL, Eurofound and EU-OSHA.

This workshop was held under Research activity n.1 “Platformisation of work” of the “Fact-based Analysis” Component of the EU-funded ILO-JRC project “Building Partnerships on the Future of Work”, to formally launch the Work Package 1 of the Action. This Work Package aims at developing new knowledge on platformisation of work, namely algorithmic management within and beyond digital labour platforms. This is an aspect of the Future of Work, relevant for the EU and other key countries, which require further analysis and understanding.

Moreover, the workshop was a milestone for two others related research activities of the JRC. It was organised under the Task 1 “Digital platform work and its policy implications” of the DG EMPL-JRC Administrative Agreement “FutureJobs”. This includes the development and validation of a conceptual framework to study algorithmic management and its impact. The workshop also complemented the research activities undertaken under the Collaboration between EU-OSHA and the JRC. These include the development of a framework to analyse new forms of monitoring and new forms of management in the digital economy, linked to algorithmic management.

Thanks to the synergies and the network developed through all these projects, the workshop brought together key experts in the field, in Europe and beyond. Speakers and participants included experts from the academia, EU institutions and agencies, international organisations and research centres. This allowed the research team to go through a comprehensive agenda, delving into several aspects of algorithmic management and impacts on workers, and to stimulate a highly informed discussion on the issues at stake, tackling both research and policy challenges.

The workshop objectives included:

- Validate a conceptual framework to study algorithmic management and its impact, within and beyond digital labour platforms;
- Present and get feedback on an analytical approach to case studies on algorithmic management and its impact in traditional workplaces in the logistic and health sectors, accounting for different country context (i.e. in the global north and global south);
- Present and discuss the evidence on the diffusion and impact (e.g. on skills and OSH) of algorithmic management practices and related digital tools used for monitoring and surveillance.

These objectives have driven the workshop discussion, organised in four sessions (see Workshop Agenda) and presented below in the remainder of this reporting document. The conclusions drawn from the workshop in relations to the objectives are summarised in the closing section of this reporting document.

► Notes on the proceedings

Introductory remarks

In opening the workshop, Enrique Fernández Macías (JRC) acknowledged the collaborations and research project that made the workshop possible. He explained that the workshop is part of research activities that focus on the impacts of technological change, as part of the changing nature of work. He remarked the added value of having both a global and European perspective on this.

Session 1 - Algorithmic management evolution and policy implications

The first session introduced concepts related to algorithmic management, outlined its impact on workers within and beyond digital labour platforms, and sketched avenues for policy making.

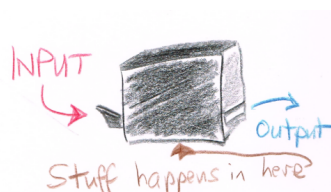
Alex Wood (University of Birmingham) presented a **framework to study algorithmic management** going through the following discussion points:

- It is not really clear what algorithmic management means in practice. An algorithm is “a process or set of rules to be followed in calculations or other problem solving operations”. Algorithms are nothing new, but the new element is the technology. Computer power and data collection boosted the potential for algorithmic decision-making, towards algorithmic management, namely the use of algorithms transforming input data to output for management decisions.
- Depending on the type of decisions made using it, algorithmic management can consist in automation of direction, of evaluation, or of discipline. This conceptualisation relies on the work by Kellogg et al. (2020) and on the review of the empirical literature, mostly on platform work but also in traditional sectors (Wood, 2021). Some examples are:
 - **Algorithmic direction in platform work** is found when platforms automatically allocate fares/orders and provide routes via GPS, with very limited room left to workers’ decisions. **In traditional workplace**, algorithmic direction is found in warehouses and retail sector, thanks to handheld and wearable devices that collect data and communicate tasks to workers. In manufacturing, it consists in software planning production in real time to instruct workers. In professional services, it results, for example on alerts when projects are behind schedules.
 - **Algorithmic evaluation in platform work** is exemplified by customer ratings or acceptance rates, in ride hailing and professional service platforms. **In traditional sectors**, algorithmic evaluation is found in the delivery sector, through monitoring weekend shifts, average working hours, and ratings systems, for example. In warehouses, devices record pick-rates, compared to targets elaborated by software and aggregated to rank individual workers, according individual speed and productivity.
 - **Algorithmic discipline in platform work** is exemplified by automatic deactivation of workers with low ratings, in ride hailing platforms. Although, platforms claim that human managers are reviewing these decisions. Similarly, **in traditional sectors**, warehouse firms send messages to confirm/cancel shifts based on productivity index made by the algorithm.
- Often employers and platforms argue that these software help managers to make decisions. However, workers tend to perceive that the software make automated decisions.

He concluded that **algorithmic management implies direction, evaluation and discipline done by the algorithms with the expectation of the human manager to review, at least**. Based on the classification by the Society of Automotive Engineers 2014 for self-driving vehicles, it is possible to classify the level of automation in algorithmic management. Full automation of management does not really exist, yet, although digital labour platforms are often those most automated, with at least conditional/partial automation.

Annarosa Pesole (Italian Ministry of Labour and Social Affairs), discussed the policy implications of algorithmic management. She started by highlighting the **challenges stemming from algorithmic management**, including bias and discrimination, higher control and surveillance, worsening working conditions, lower bargaining power, detriment of employment contract and endangering of workers’ dignity. To address these challenges, **policy making** should proceed following the steps of algorithms, namely input data, black box “processing”, output decision (**Erreur ! Source du renvoi introuvable.**).

► Figure 1. The process of algorithmic management



On the input side:

- Primarily, data quality needs to be ensured, setting criteria for reliability.
- Dealing with data protection and governance is important, to ensure that the use of data is fair and transparent, protecting privacy. Algorithms use personal and non-personal data. The combination of the two can make it difficult for data protection policy. For example the EU GDPR applies only to personal data. The EU Data Governance Act extends to non-personal data, fostering fair and transparent communication between all actors. Yet, this is yet to be enforced.

Regarding the black box, policy implications are about transparency of algorithms:

- Transparency of algorithms is important, but its meaning is still unclear, as regulations need to specify if they refer to transparency on criteria, parameters, or source code of algorithms.
- Transparency legislation should not be like privacy protection legislation, namely based on consent, because it does not ensure informed users. For example, the Article 22 of GDPR states that in Europe no one can be subject to decisions from a purely algorithmic output, but data-subjects' explicit consent can derogate to this rule.
- On transparency, trade and commercial secret issues are raised by platforms. Yet, there are aspects of algorithms that can be disentangled from sensitive information to be disclosed.

On the output side:

- Regulating the output of algorithmic management is important, especially because existing labour laws do not apply if workers are not recognized as employees. Many agreements on working conditions go through trade unions, which are weak in the platform economy, and in other places. Guaranteeing freedom of association and collective bargaining is critical. Negotiating the characteristics of algorithms could be an option at the confederation level rather than at business unit level.
- Workers' dignity should be at the core of regulation, as algorithmic surveillance expands.
- Ratings lock workers to one platform. Data portability could help, but platforms oppose to it because of trade secret.
- Dispute settlements need to be cross border, as platforms function across jurisdictions.

As a concluding point Annarosa Pesole stressed that **policy needs to allow negotiating the algorithm, and for this trade unions need to be empowered.**

Adrián Todolí Signes (University of Valencia) presented on the **risk of discrimination of algorithmic management and regulation to prevent it**, discussing the following points:

- The risk of discrimination is a systemic problem, as the nature of algorithms leads to bias:
 - Algorithms are capable of inferring certain personal features based on other data.
 - The algorithm incorporates factual reality as a learning factor, including its biases.
 - Minorities are disadvantaged because algorithms make decisions based on available data. There is by definition less data available for minorities, because they are minorities.
- When algorithms are in command, there is not only risk of discrimination but also for OSH that could be compromised when workers have to follow algorithmic instructions. Human supervisors would understand workers' decisions to preserve OSH, while algorithms do not. Humans validating algorithm decisions are not enough, they need to be significantly involved.
- Art. 22 of GDPR protects data subjects from being under the command of algorithms. The language of GDPR has been interpreted as forbidding the use automated decision making that have legal effects – this can include hiring, promotion, dismissal etc. Therefore, significant human intervention needs to be present. However, the law has exceptions, for example through data subject's explicit consent. The second exception is when automated decision making is used to process large amounts of data. This

might incentives to companies to gather even more data. Moreover, the GDPR has an individual approach, which does not incorporate trade unions.

- The Spanish approach overcomes some of these limitations:
 - It gives worker representatives the right to be informed about the algorithm. However, the extent of this right is still to be tested.
 - It Empowers trade unions to negotiate the algorithms. Yet, even this approach may not be enough: **there is a need for a public body**, which make algorithms accountable.

Adrián Todolí Signes concluded by stressing that the regulation of data use and algorithms is more complex than it may look. When data are forbidden to collect or use, the algorithm can still infer it.

The **open discussion with the audience** touched on the following points:

- The EC's proposal for AI regulation is a step forward to address the issues above because it considers use of algorithms as high-risk in employment matters. However, its focus is on setting requirements for firms to establish a market in Europe, rather than on workers. Companies are asked to self-asses their AI safety, while there should be a public authority to assess it. Moreover, with the non-withdrawal clause, stricter regulations holds (e.g. for trade interests).
- The GDPR might not be good enough for workers to claim their rights against algorithmic management because 1) it is only about personal data, while in work settings some data are still sensitive but not considered personal (e.g. wage setting); 2) it has the exception regarding large amounts of data; 3) it does not establish collective rights on data, limiting the action of trade unions; 4) it assigns enforcement to bodies that are not primarily concerned with workers' rights; 5) it does not concern the negative impacts of algorithmic management on job quality; 6) ultimately it protects consumers rather than workers.
- There is no trade-off between data quality and data protection. Sensitive data can deliver better outputs, while anonymization, cryptography etc. mitigate privacy risks.
- Trade unions currently face challenges to participate in the process, due to technical capacity, complexity of the process and how it is used on workers. Code ceiling is a new form of discrimination, where those who are unable to understand how algorithms work are excluded from the process. Yet, unions need to arm themselves and learn, but an institutional body (e.g. authority) is important, to make sure that algorithmic management do not produce negative outputs. Negotiating the outputs of algorithmic management is still something in which Unions can be active. The enforcement of rules on algorithmic management is going to be hard if algorithms are not accessible.

Session 2 - Advancing knowledge on algorithmic management practices

The second session presented the **approach and key concepts that the ILO and the JRC intend to use for a research project based on case studies on platformisation** (i.e. algorithmic management practices) in two traditional sectors, namely logistics and healthcare.

Uma Rani (ILO) started by introducing the **theoretical background of the project**:

- Platformisation of work includes two aspects: Algorithmic management practices and outsourcing models that were already there and have been growing further with platforms.
- The whole idea of algorithmic management practices is not new and dates back to the 1990s, when IT, BPO and Software sectors were using algocratic modes of governance to coordinate globally dispersed workers. However, this is something which is not very well researched.
- The project looks at how algorithmic management practices are expanding to traditional sectors, relying on the framework of algorithmic management in direction, evaluation and discipline (Kellogg et al., 2020). In logistics, there is quite a lot of evidence on how algorithmic management practices are used. The healthcare sector is also undergoing platformisation of work, but there is only anecdotal evidence on how algorithmic management is being used. Implications for work are not fully clear yet. The project intends to advance knowledge on how fracturing and fissuring of work through algorithmic management takes place in both sectors.

She highlighted that the chosen sectors allow the research team to study platformisation on different types of workers, including those at the higher end of the job profile spectrum (e.g. managers, doctors, finance and HR personnel, and other professionals), those in mid-level management (e.g. supervisors, mid-level managers, laboratory technicians), and those at the lower end (e.g. workers in warehouses, delivery workers, and care workers). The research on the first two categories is much more limited than on the third one and this is added value for the project.

She specified that it will be a comparative study across sectors and countries. In the logistics, the unit of analysis will consist of warehouses, and in healthcare, the unit of analysis will most likely be hospitals or health centres. The case studies will be conducted in two establishments *per* sector in two countries in Europe (France and Italy) and two outside Europe (India and South Africa).

Enrique Fernández Macías (JRC) provided some additional information on the **conceptual framework of the study and some definitions** (Fernández-Macías, 2018). He started by defining platformisation:

- Platforms are centralized digital networks that coordinate transactions in an algorithmic way, made of two elements: 1) A structured digital space where transactions can take place and 2) A set of algorithms for coordinating these transactions in an automated way. Therefore, platforms are never only a virtual place where people meet, as there is always a management of this space through algorithms. The algorithm and the people who define its parameters have implications for outcomes and shape power structures. Sometimes it is only to control transactions, some others it involves management of work processes. Platforms emphasise themselves to be a “market” rather than employers because they enable transactions. However, the coordination operated by algorithms to “manage” makes them closer to an employer.
- **Platformisation of work is the use of platforms to coordinate work processes.** This entails a structured digital space governed by algorithms. It is not restricted to digital labour platforms, and can be applied to any type of organization, including in the traditional sectors. Platformisation of work is closely linked to algorithmic management, namely the use of computer-programmed procedures for work coordination. Yet, algorithmic management is only part of platformisation, as it does not necessarily have a structured digital space

He introduced the concepts of automation and digitisation. The focus of this project is on platformisation, but in empirical investigations platformisation is often entangled with digitisation, their implications being difficult to differentiate. An analytical attempt should be made to keep the focus on platformisation and disentangle its effects.

- **Digitisation:** Use of devices to translate parts of physical production process into digital information and vice versa. Because of massive processing power and storage capacity, the shifting of information to the binary world is easy, providing a precondition to platformisation. There are, however, examples of platformisation of work where digitisation is limited, and vice versa. Digitisation is about information, while platformisation is about coordination.
- **Automation:** replacement of labour input by relatively autonomous machine input. Platformisation can lead to automate lower and mid-level managerial functions through algorithms. It also leads to standardisation, which has historically preceded automation.

He underlined that the logistic and healthcare sectors are interesting because they are labour intensive, require complex coordination and have differences that make them suitable for comparative analysis. Logistics involves workers with lower educational profiles, and is increasingly digitised. Healthcare involves workers with higher education profiles, is less digitised but used to complex work processes and subcontracting. Information to collect through the case studies include:

- Extent and modalities of platformisation in the workplace
- Impacts on business models, division of labour and work organisation, including occupational structure and task content.
- Impacts on job quality, such as wages, employment conditions, working time, health and safety.
- Industrial relations in the workplace, namely how these are impacted by platformisation and how they affect and shape the process of platformisation.

During the **open discussion, participants asked clarifications and gave feedback** on the following:

- The project will look at work intensification, as an important aspect of job quality at risks in both the logistics and healthcare sector. Empirical studies already show that introduction of robots leads to work intensification. It will be interesting to see how this negative impact differ across countries, depending on policies. Number of hours worked can measure it. Another indicator is whether certain tasks previously done by different workers are assigned to only one worker. Being a qualitative study, it will include also subjective measurements.
- The project will consider the role of financing and balance of interests on the outcomes of platformisation. Most of the pressure on work in platforms comes from the nature of financing, through venture capital. The discussions are about making things more efficient, not about labour conditions, similar to earlier industrial revolutions. Work intensification is impacted by the venture capital investments in platforms. It will be interesting to compare the logistics and healthcare sectors with the platforms as well.
- The project will explore whether algorithmic management leads to higher precariat and to what extent workers have a voice in platformisation and in algorithmic management practices.
- Since the industrial revolution, the search for higher productivity has led to automation and fragmentation of the production process. However, fragmentation (i.e. subcontracting) and technological change have not always gone hands and hands. Division of labour (i.e. segmentation of production into simple tasks) has commonly accompanied technological change, but sometimes reducing outsourcing and subcontracting, for example during Fordism.
- The analytical distinctions of the three trends should not lead to think platformisation as inevitably following digitisation. There is no inevitability in social sciences. As soon as things are digitised, platforms are a very efficient way of coordinating, but there

might be game changers, such as diffusion of open source. Moreover, it may be difficult to disentangle algorithmic management and digitisation on the field, as in reality these processes occur simultaneously. The trends are analytical tools. It is important to first explore how they occur and then disentangle them.

Session 3 - Digital monitoring and surveillance in digital labour platforms

The third session was dedicated to **algorithmic surveillance and monitoring**, with the presentation of Kirstie Ball (St. Andrews University). Based on a systematic review of the literature (Ball, forthcoming), she presented on monitoring and surveillance in digital labour as summarised below: Platform work is promoted on the basis that it is flexible, accessible and enables autonomy. However, problems relate to the way in which algorithms assign tasks and organise work. Algorithmic control is exerted in accessing work, especially at the beginning, when work is actually underpaid (e.g. work done to access the platform and gain reputation). Then, it involves mechanisms to exclude workers from the platforms.

- The 6Rs model (Kellogg et al 2020) sets out how algorithms exert control over platform work, namely: Restricting behaviours; Recommending courses of action; Recording activity; Rating activity in real time; Readily replacing people ; Rewarding and gamifying high performance.
- According to the literature on surveillance and monitoring, surveillance can be defined as “Any collection and processing of data, whether personally identifiable or not, for the purposes of influencing and managing those whose data have been garnered” (Lyon, 2001: 2). It is linked to the concept of “social sorting”, namely the use of data-derived electronic profiles of employees to drive decision making about them. Surveillance in platforms resembles very much the “most pervasive” type of surveillance, as in the model developed by Grant and Higgins (1989) much earlier than platforms started, as in Figure 2.

► Figure 2. Pervasiveness model

	Least pervasive		Most pervasive
Object	Business unit	Work group	Individual
Period	Regular	Regular	Immediate
	infrequent	infrequent	
Recipient	Employee	Supervisor	Public
Tasks	Track results	Track process	Assign and track

- To engage with platforms and the manner in which work is algorithmically controlled, workers develop an “algorithmic imaginary”. It consists in anticipatory compliance with algorithmic rules (e.g. not complaining, not reporting too many problems, etc.) and internalised norms (e.g. blocking bad customers, adopting an entrepreneurial style, etc.).
- Yet, psycho-social risks are systematically associated with platform work, such as frustration, bias awareness, reduced well-being, loss of privacy, lack of ability to challenge results and decisions, lack of fair representation, precariat, stress, etc..
- Based on labour process theory, algorithmic control, enforced through monitoring and surveillance, reflects the frictions between capital and labour’s interests on production. This is why it is interesting to look also at workers’ forms of resistance to algorithmic surveillance and monitoring in digital labour platforms, also known as “algo-activism” (as in Kellogg et al., 2020). This includes namely: Practical actions, as non-cooperation; Platform action, as knowledge sharing on fora among workers; Discursive framing of unfairness, as engaging in public critique; Legal and collective mobilisation, such as demonstration or public awareness raising.
- As platform-like forms of surveillance expand to traditional workplaces, data are collected by people analytics tools (e.g. for recruitment, promotions, training paths). These have a very wide range of data requirements, classified by Fernandez and Gallardo-Gallardo (2020) as in Figure 3.

► **Figure 3. Data collected by platforms for monitoring and surveillance**

<i>Data related to...</i>	<i>Type of data</i>
Employees outside the organization	Demographic data, Education, Participation in social networks
The position of the employee in the organization	Type of hire, Status of the position, Salary and benefits, Changes in the organization, Date of last promotion
Work carried out in the organization	Individual performance, Performance evaluations, Sentiments and assessments, Content and the receivers of their messages in organizational platforms
The employee herself/himself/themself	Personality traits, Cognitive abilities and skills, Expertise, Training undertaken

She concluded that to assess the impact of algorithmic surveillance on workers in digital platforms it is possible to draw from the literature on surveillance in traditional workplace. This suggests that it is possible to learn possible mitigating measures (e.g. workers involvement in technology design).

The **open discussion with the participants** touched upon the following items:

- The “autonomy paradox” gives workers in platforms the illusion of autonomy so that they can overcome the negative effects of surveillance (at least to some extent to keep them doing the job). Yet, in traditional workplaces, where control and coercion are much stricter, the impact could be even more negative, resulting into very high turnover rates (e.g. in call centres). The reaction and impact of algorithmic monitoring and surveillance depends also on individual differences. There is no one size fits all solution and there could be self-selection on people in algorithmically controlled jobs being more prone to rules and supervision.
- Telework boosted digitisation and the use of software to collect and analyse data on working time (e.g. time spent in meetings), but also for data mining on emails to collect and analyse sentiments and emotions. It is never sure whether and how firms use software for monitoring and surveillance. It is interesting to look at studies that investigate data-rich software, their selling points and how customers respond.
- It is particularly challenging to build trust and “true” awareness (i.e. not only being aware of being monitored, but also of the health impact, career opportunities, etc.). It is key to be careful about what aspects of the working relations are being monitored and the scope and aim of monitoring for example by establishing clear procedures, sharing information about the process, ensuring transparency of decisions. Participation of workers in technological design could mitigate negative impacts. This remarks the role of trade unions in pushing and ensuring involvement of workers in each step of algorithmic monitoring and surveillance.
- Data are collected to increase value created, by selling to third parties or making production more efficient. This raises attention on how to share this additional value created with workers who create the data, which questions the business model of the platforms itself. There may be a new paradigm of capitalism arising, where the rules are written only by a small group of individuals who are in control of the algorithms. The big debate is on how to re-write and shape these rules in a fair manner. An important boundary is also between private and work-related data, which is getting blurred.

Session 4 - Roundtable on Developments in digital forms of management and impact on workers

The fourth session gave an overview on **how algorithmic monitoring and surveillance impacts on workers**, within and beyond digital labour platforms, and including the diffusion of monitoring digital technologies that enable it. The roundtable touched upon several aspects, **ranging from OSH to skills development**.

Uma Rani (ILO) described the **monitoring system in digital labour platforms** often built on rating system. Based on the World Employment and Social Outlook (ILO, 2021), she went through the following discussion points:

- The business model of platforms uses algorithmic management practices for allocating work, matching, monitoring, and evaluation, through rules determined by a selected few. Investors push for productivity and efficiency. But data itself generates revenues, while being used for automated-decision making. Revenues are generated also by charging fees to platform workers.
- Ratings have a huge impact on workers’ access to work, but indicators to determine ratings are a black box. This indicates the need of transparency and accountability. Other factors can also influence workers’ access to work, such as subscription plans of various price ranges. Workers from certain developing countries can be blocked from accessing the platform. This can lead to

perverse practices, such as accounts for platforms being traded. By contrast, educational qualifications do not play an important role, and education is hardly mentioned on platforms.

- Ratings are affected by rejection of work or cancellation of work, disavouring workers. Mechanisms are based on automated decision-making, making it difficult for workers to demand for feedback event of a rejection. Humans are involved in the process, but because of the terms of service, workers do not have the autonomy or control to contest and dispute resolution mechanisms are limited. Workers have very little time to accept or decline work and cannot cancel work without repercussions, which include lower ratings, suspended accounts, fewer rides or orders, penalty and fines, longer waiting times, reduced bonuses. These raise important questions about freedom at work.
- Workers are monitored regularly and have limited autonomy and control. Workers have specific hardware and software tools, used to monitor them and negatively impacting working hours. Failing to comply with monitoring systems could reduce access to work or result in deactivation.
- A large share of workers noted deactivation of their accounts, mainly because of customer complaints, cancellation of rides, and violations of platform rules, which are closely monitored, unawareness about formal processes for filing complaints.

She remarked that the changes delivered by platforms are accompanied by a sound discussion on job quality and content of work. Algorithmic management is not considered part of labour laws, being under the WTO e-commerce discussions, while it should involve labour laws as well. Moreover, a huge skills mismatch and over-qualification can be seen, as the rating system is changing the relationships between education, skills and access to work. This raises questions on returns to investment in education and training systems.

Sara Riso (Eurofound) discussed **the use of data analytics for employee monitoring, beyond digital labour platforms** in European establishments (Eurofound and Cedefop, 2020; Eurofound, 2021). Points of discussion included:

- The survey asked about the use of data analytics for improving processes and/or monitoring employee performance. The results indicated that:
 - 51% establishments in EU27 used data analytics. Of these, 24% used it for process improvement only, 5% for monitoring of employee performance only and 22% for both purposes. This suggests that data analytics tend to be introduced in establishments for improvement of production processes rather than employee monitoring *per se*.
 - Data analytics for employee monitoring only was reported more in several eastern European countries. Data analytics is more prevalent in transport and less in construction. Large establishments are more likely to use data analytics.
 - Based on cluster analysis, more than half the establishments in the group characterised by 'high use of robots' use data analytics for monitoring employee performance.
 - Use of data analytics is positively correlated with the presence of a recognized body for employee representation in the establishment.
- The survey asked the managers about the use of data analytics for monitoring employee performance, by different work organisation modalities. It tends to be higher when the pace of work is determined by machines and computers, and lower in establishments where there is an autonomous organisation of work and scheduling.
- The survey also indicates that high-performance characteristics of the establishment (e.g. teamwork, paid training, variable pay) tend to be associated with higher use data analytics for monitoring employees. Data analytics tend to be associated with higher establishment performance, too. By contrast, employee well-being is higher for establishments where use data analytics for monitoring employees is lower.

She highlighted a Eurofound study on positive outcomes on workers' well-being, e.g. inclusion of people with disabilities, which deserve attention to weight benefits and losses of data analytics.

Konstantinos Pouliakas (Cedefop) presented on **algorithmic management and implications on skills**. He started by recalling the key determinants of skills formation in traditional workplaces, such as time and stability to learn, autonomy and complexity in tasks and jobs, and organisational features such as learning incentives and employees' voice,

He continued highlighting that the platform economy has raised some concerns and added new elements. It is important to understand if workers with less training opportunities want to participate in platform economy to develop their skills or acquire new skills. Yet, workplace learning is an organizational matter, while in the platform economy it is a solitary endeavour. The Cedefop's Crowdlearn studies reveal that:

- To enter the platform generally high level of skills and educational qualifications are needed.
- Platform work may enable the development of certain skills, especially self-marketing and promotion skills and other soft skills.
- The platform economy has fragmented learning and leads to piecemeal learning. It tends to involve quick and short episodes of learning that can be algorithmically determined, sometimes fostering 'knowledge filter bubbles'. Many are going to Youtube to learn rapidly for the client, so as to get better ratings.
- Workers noted that 'time learning is time not earning', highlighting the marked pressures and opportunity cost of investment in skill formation in the platform economy.

- There is a two-tier system, and algorithmic vetting takes place, especially for newcomers.
- If mistakes are made initially by the worker or if rated with poor customer ratings, then it becomes more difficult to progress and one can get penalised in accessing further work.
- The platform also penalizes workers making it increasingly difficult to become a star performer, thus diminishing crowdworkers' prospects and project opportunities.
- Skills portability is important. However, because of the idiosyncratic technical and algorithmic infrastructure of platforms, it is very difficult to have portability, both online and offline, namely to transfer ratings and one's skills portfolios across and beyond platforms.

He noted that the impacts on skills formation might be negative. Skills development requires stability and time, while platforms perpetuate casualisation. Microtasks are counter to complex tasks and jobs, which foster learning. Ratings and surveillance limit the possibility of making mistakes, conducive to continuing learning. Algorithmically determined targets put pressure and additional time barriers to the learning process. Finally, working in organizations that invest in (big) data more than human resources could result in workers' lack of motivation in learning. He concluded by mentioning the launch of a 3-year study using a mixed-methods case study approach, to understand how algorithmic management impacts workplace learning within EU establishments.

Emmanuelle Brun (EU-OSHA) continued the roundtable referring to **new digital forms of monitoring and management and their impact on OSH**. Based on EU-OSHA projects on the topic, she discussed the following points:

- Psychosocial risks arise from new forms of monitoring and management, which can impact mental health, and also result in MSDs, cardiovascular diseases, and accidents. The risks include:
 - Micro management; reduced job control and autonomy; increased work intensity.
 - Cognitive overload, or also underload, due to breakdown of tasks or repetitive tasks.
 - Performance monitoring and pressure, limiting breaks.
 - Lack of social support from peers and managers.
 - Unstable work schedules, associated with blurring work and private life.
 - Job insecurity, as one of the major factors of work related stress.
 - Privacy invasion, lack of transparency in decisions and the black box of algorithms.
- The OSH Framework Directive (Directive 89/391/EEC) is general and by default covers any types of risks. It sets up obligations on employers to consult workers on introduction of new technologies and to involve them in discussions on safety and health at work, which would include those associated with algorithmic management. However, the enforcement is challenging due to the black-box nature of algorithmic management.
- There are also potential opportunities for OSH, following new digital forms of monitoring and management, but these need to be explored with caution, to define proper regulation, design and implementation. Potential opportunities for OSH include the following:
 - Use of data to reduce psychosocial risks and harassment.
 - Real-time tailored advice to individuals and evidence-based prevention and intervention.
 - Accurate and timely risk analysis, advanced workplace risk assessments, and risk-based targeted OSH inspections.
 - Evidence-based policy making.
- The 3rd European Survey of Enterprises on New and Emerging Risks (ESENER) shows that:
 - Only 6% of EU establishments surveyed were not using any digital technologies. About 20% used at least one of the three technologies for monitoring and management (i.e. machine systems for determining content; machine systems for monitoring performance; wearables).
 - Less than 1 in 4 discussed potential impacts on OSH related to the use of digital technologies. Those using PCs, tablets, smartphones and other mobile devices are those that less discuss possible impacts on OSH. These are the technologies used among others by teleworkers and mobile workers, who are exposed to multiple work-related risks including ergonomic and psychosocial risks. Among establishments discussing the impacts, the share of those using wearable technologies was high. Among the impacts discussed, increasing work intensity and time pressure was high, particularly among those reporting the use of workers' performance monitoring technologies.
- A consultation of EU-OSHA's national focal points identified initiatives to address the OSH impacts of new forms of management such as national OSH strategies or initiated by actors such as the Labour Inspectorate, Data Protection authorities, Ombudsman and trade unions.
- Ensuring safe, healthy and productive new ways of working will require:
 - User centred prevention through design approach to OSH.
 - Workplace risk assessment of new forms of management, not delegated to technology.
 - Humans in command, with support not replacement by technology.

- Data minimization.
- Transparency, workers' participation and equal access to information.
- Awareness raising, sharing information and training with all stakeholders.

She recalled that a EU campaign on safe and healthy work in digital age will start in 2023.

Cesira Urzi Brancati (JRC) presented an empirical analysis on all these aspects (Urzi Brancati and Curtarelli, forthcoming), studying **the relationship between new digital forms of monitoring, psycho-social risks and OSH policies**, discussing the following points:

- Employers are increasingly using digital systems and technologies to optimize resource allocation; improve work processes; support decision making; and increase labour productivity.
- The hypothesis is that the use of selected technologies is associated with increased psychosocial risks by boosting job demands and decreasing worker's autonomy. Moreover, it also assumes that OSH preventive policies in the workplace can mitigate increased risks.
- The conceptual approach explores the relationship between management technologies (devices to monitor performance, determine content/pace of work, and wearable); OSH measures (action plan to reduce stress, reorganization of work, counselling, etc.); and psychosocial risks (time pressures, long working hours, fear of job loss, having to deal with difficult customers/clients/patients, and poor communication/cooperation), while controlling for organizational and contextual factors (firm size, atypical contracts, employees working from home or outside the premises, etc.).
- The econometric analysis led to some preliminary findings:
 - Management technologies are associated with an increase in psychosocial risks. The relationship is stronger for technologies monitoring performance and weaker for wearables.
 - The presence of an action plan to prevent work-related stress is associated with a decrease in psychosocial risks.
 - The OSH measure does not appear to have a mitigating effect on the impact of the technology – in other words, psychosocial risks are higher in establishments with management technologies regardless of the presence of an action plan to prevent stress

The final **open discussion** with the audience touched on the following points:

- Rather than de-skilling, one should talk about routinisation of work. Skill intensity is rising, in the employment pool. But, within jobs and occupations, work is becoming standardised and routinized. Moreover, the extent to which people are challenged to improve their skills is lower. Yet, there are many resources being channelled into lifelong learning, but skills development is changing its nature, becoming fast and fragmented. Discussion is underway on micro credentials and many learning operators provide rapid learning. There is an impression that more learning is taking place, but it is important to look at quality, and the holistic knowledge base, which is probably lower. It also depends on the part of labour market discussed. The traditional sector can give some space for more complex tasks, and there are enterprises which will invest in skilling, and lifelong learning comes in play. On micro-task platforms, there is deskilling, as fragmenting tasks can lead to deskilling or at least platforms seem to display a mechanism through which workers' skills are already expected, with no participation from the platform itself. Even highly educated workers are performing low-end tasks.. However, platforms are also becoming a place to learn. For example, competitive programming platforms have become a space where even many universities are coming. All this raises fundamental questions about education policy, and whose interests it is addressing. It depends also on the category of workers. Digital technologies drive skills for engineering and managerial skills. For blue-collar workers, it is about learning on the job, involving basic digital skills, related mostly to specific technology. This limits transferring skills to other companies. These types of employees are at a disadvantage and should be targeted by education and training policy.
- The fragmentation of learning and the disconnection between education and training with skills and access to work has implications for formal education and training. This is already adapting to this new reality. Most major universities offer courses online and are likely to develop collaborations with platforms. Yet, platform companies, and some of the workers too, trust the platform training more than formal education system. As universities and formal education systems will jump on the bandwagon, they should not embrace fragmented education for younger people, as their role is important for holistic learning.
- There is a tension between the lack of transferability of skills, and the push for labour market mobility, which requires adaptability to different environments. This has implications for psychosocial risks, such as job insecurity Research has not yet investigated this aspect in detail. Based on research on platforms, platform work foster not only job insecurity but also, development of very specific skills sets and new types of risks there is a lot of job insecurity. For instance, highly educated workers perform content moderation, seeing explicit images that have major OSH/psychosocial risks. More research is needed on the career trajectories of highly skilled workers entering into labour platforms.

Concluding remarks

The purpose of this workshop was to share knowledge among participants and to contribute to shape public policies related to algorithmic management and its impact on workers. The main takeaways from the workshop are:

- Although a fully-fledged level of automation in decision-making is not there yet, algorithmic management is progressively spreading from digital labour platforms to traditional workplaces. It is taking over management functions such as direction, evaluation and discipline. A conceptual framework to study algorithmic management and its impacts can be built around the classification of the levels of automation in each of these functions.
- Some mechanisms in place are not completely new, such as the organisation of production through standardised rules as scientific management practice, or the enforcement of monitoring and surveillance to exert control over workers. However, the potential of the digital technologies increase the scope and the extent to which these mechanisms are applied to gain control over the production process and the workers.
- Challenges and risks that are normally associated to platform work, are rapidly spreading to a larger share of workers employed in the traditional sectors where algorithmic management is deploying. These challenges include bias and discrimination issues, but also working conditions and job quality, including OSH. A changing nature of skills development, which is becoming more fragmented and more oriented to job-specific requirements, is transforming the relationship between education, skills and access to work. Finally, algorithmic management might entail a transformation of the employment relationship, through subcontracting, outsourcing and casualisation of work, which is under researched.
- Algorithmic management's key elements are the inputs, the black box "process" and the outputs. Accordingly, policies has to tackle these three aspects, bearing in mind that the complexity of the transformations at stake is high and no quick-fix isolated solutions can be put in place. For example, regulations that only address data issues might not be enough, especially if referring only to personal data, because there are different types of data involved in algorithmic management. Moreover, addressing the challenges of algorithmic management requires both laws and enforcement, which could be supported by the creation of an ad-hoc public authority.
- The role of trade union could be pivotal to rebalance control over algorithmic management, which now deeply disfavours workers. For this, not only individuals, but trade unions, specifically, need to be empowered to act collectively. Their areas of actions can range from supporting workers in getting information on algorithmic management use and its impact, knowing and negotiating several aspects of the algorithms with the firms, and bargaining the outcomes of algorithm management, namely the decisions that are taken on its basis.
- In particular, algorithmic management and related digital technologies are increasingly used for monitoring and surveillance, in platforms but also in many traditional workplaces. As data and elaboration power increase, monitoring and surveillance becomes pervasive, triggering compliance mechanisms, but also forms of resistance among workers, which may ultimately hinder individual and company performance. Overall, it increases several psycho-social risks for the workers and damage their relationship with the firm. While the use of digital technologies is associated with better firms' performance, it is also associated with lower workers' well-being, on average, which require OSH policy interventions and industrial relation negotiations on shaping monitoring and surveillance systems.
- As a general conclusion to orient research and policy making, the complexity of algorithmic management and the depth of its impacts seem to be triggering a systemic change. Although further research is needed into many aspects still in the shadows, it seems that the rules of the unfolding new system are being shaped by a few in control of algorithms and related digital technologies. This leaves room open for policy interventions and industrial relations to re-balance the distribution of benefits and losses from algorithmic management deployment.
- As a methodological and conceptual conclusion, given its complexity and rapidly changing nature, it is useful to study algorithmic management acknowledging the overlap of the three key trends that relates to its developments and consequences, namely platformisation, digitisation and automation. Although these are distinct concepts, in reality they tend to be interlinked and happening all together. This is why it is also relevant to look at the deployment of digital technologies, even if these do not constitute fully-fledged algorithmic management practices. This is particular relevant in traditional workplaces where algorithmic management per se tend to be still rarer than in digital labour platforms.

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